Alternative 4

Alternative 4 would result in a disturbance area of approximately 5.1 acres. Estimated earthwork amounts would include approximately 13,900 cubic yards of cut and 25,100 cubic yards of fill. Potential impacts on sensitive areas would be similar to those identified for Alternative 1.

Mitigation Measures

The proposed project would comply with City of Redmond development regulations, including regulations for environmentally sensitive areas. NPDES permit coverage would also be obtained. Specific mitigation measures would include:

- Reseeding any disturbed area with an appropriate native species seed mix. Landscaping would emphasize the use of native plants.
- Minimizing tree loss as much as possible. Any trees lost would be replaced on-site according to the City's Tree Protection policy (CDG 20D.80.20).
- During construction, implementing temporary erosion and sediment controls (TESCs) in accordance with Volume II of the 2001 Ecology *Stormwater Management Manual for Western Washington* (Washington Department of Ecology, 2001). Best Management Practices (BMPs) to control the release of pollutants into surface water would be implemented during construction.
- To mitigate the unavoidable vegetation loss caused by the build alternatives, contribute to the City's efforts to restore riparian vegetation along the Sammamish River and Bear Creek.

Significant Unavoidable Adverse Impacts

Minor earth disturbances would occur to accommodate construction activities, including roadway replacement, widening, and new construction as needed.

Air Quality

The City of Redmond's transportation plan must be in conformance with the Federal Clean Air Act, the State Implementation Plan, and the Washington Clean Air Act. It is the City's responsibility to submit regionally significant transportation projects to the Puget Sound Regional Council (PSRC) for inclusion in the Regional Transportation Plan and the Transportation Improvement Program.

To evaluate the impacts of the proposed Bear Creek Extension project on air quality, concentrations of carbon monoxide (CO) were calculated for existing conditions (2002) and predicted for the project design year (2030) using the MOBILE 6.2 and CAL3QHC Version 2 models. Ozone concentrations that could result from this project were not modeled, because ozone is a secondary pollutant generated through a series of complex reactions between pollutants emitted from motor vehicles and other sources. Total ozone precursor emissions for the study area were modeled to compare the alternatives. Particulate emissions would be primarily construction related, and are described in the following *Environmental Impacts* section.

The air quality modeling includes new roadway alignments and intersection improvements in the project area. The six intersections modeled for air quality were selected based on traffic volume, level of service, and the impact of the proposed project on traffic flow (see Figure 3.1). The specific traffic modeling methodology used is described in the *Transportation* section of this report.

Affected Environment

Air quality in the project area is regulated by the U.S. Environmental Protection Agency (EPA), Washington State Department of Ecology (Ecology), and Puget Sound Clean Air Agency (PSCAA). Under the Clean Air Act, the EPA has established the National Ambient Air Quality Standards (NAAQS), which specify maximum concentrations for CO, particulate matter less than 10 micrometers in size (PM_{10}), ozone, sulfur dioxide, lead, and nitrogen dioxide (see Table 3.2). These regulated pollutants are referred to as *criteria pollutants*. Transportation sources generate CO, particulate matter, nitrogen dioxide, and ozone precursors. The NAAQS eight-hour CO standard of 9 parts per million (ppm) is the standard most likely to be exceeded as the result of transportation projects and is used as an indicator of overall air quality. Nonconformance with NAAQS may threaten funding of transportation projects in the area.

Table 3.2: Summary of Ambient Air Quality Standards

Pollutant	National Primary Standard	Washington State Standard	PSCAA Regional Standard
CARBON MONOXIDE (CO)			
One-Hour Average (not to be exceeded more than once per year)	35 ppm	35 ppm	35 ppm
Eight-Hour Average (not to be exceeded more than once per year)	9 ppm	9 ppm	9 ppm
PM_{10}			
Annual Arithmetic Mean	50 µg/m^3	50 µg/m^3	50 µg/m^3
24-Hour Average Concentration (not to be exceeded more than once per year)	150 µg/m^3	150 µg/m^3	150 µg/m^3
$PM_{2.5}$			
Annual Arithmetic Mean	15 µg/m^3	NS	NS
24-Hour Average Concentration (not to be exceeded more than once per year)	65 µg/m^3	NS	NS
TOTAL SUSPENDED PARTICULATES (TSP)			
Annual Arithmetic Mean	NS	60 µg/m^3	60 µg/m^3
24-Hour Average Concentration (not to be exceeded more than once per year)	NS	150 µg/m^3	150 µg/m^3
OZONE			
One-Hour Average (not to be exceeded more than once per year)	0.12 ppm	0.12 ppm	0.12 ppm
Eight-Hour Average (not to be exceeded more than once per year)	0.08 ppm	NS	NS

Notes: ppm = parts per million
µg/m^3 = micrograms per cubic meter
NS = No Standard

Sources: PSCAA Regulation 1 (1994)
40 CFR Part 50 (1997)
WAC chapters. 173-470, 173-474, 173-175 (1987)

Nonattainment areas are geographical regions where air pollutant concentrations exceed the NAAQS. Air quality maintenance areas are regions that have recently attained compliance with the NAAQS. Redmond is currently located within a maintenance area for ozone and is in attainment for all other criteria pollutants (PSRC, 2001). The air monitoring stations closest to Redmond are located in Lake Forest Park, Bellevue, and Lake Sammamish State Park.

Air quality emissions in the Puget Sound region are currently managed under provisions of Air Quality Maintenance Plans (AQMP). PSCAA and Ecology developed the current plans, and the EPA approved the plans in 1996. All regionally important transportation projects in the Puget Sound Air Quality Maintenance areas must conform to the AQMPs. Conformity is demonstrated by showing that the project would not cause or contribute to any new violation, would not increase the frequency or severity of any existing violation, and would not delay timely attainment of the NAAQS. Because the Bear Creek Parkway project is located in the ozone maintenance area, it must be evaluated for conformity to the AQMP for ozone. The project does not require CO or PM_{10} conformity determinations because the project area is in attainment for these pollutants.

Methodology

Predictions of existing and future localized air pollution concentrations in the project vicinity are made for CO only. Most other pollutants must be monitored and dealt with regionally. This is done for four reasons:

- Total CO emissions in the atmosphere from automobiles are greater than the emissions of all other pollutants combined. For example, in 2015 an average automobile traveling at 35 mph is expected to emit approximately 13.6 grams of CO per mile of travel, but only 1.5 and 2.2 grams of HC and NO_x, respectively (Mobile 5a results).
- Motor vehicles are the greatest source of CO emissions, accounting for over 90% of total CO emissions in urban areas. Therefore, it is generally not necessary to account for other (often unquantified) sources of CO near the project area (U.S. EPA, 1993).
- The complex reactive natures of some other pollutants are such that accurate predictions of local ambient concentrations cannot be made using current modeling procedures (Wayne, 1991);
- CO emissions from motor vehicles may be high enough to affect individuals in the immediate area, but most other pollutants would not have this effect (Erlich, 1977).

Average carbon monoxide (CO) peak-hour concentrations (in parts per million: ppm) were calculated using the PM peak-hour traffic volumes presented in the Transportation Analysis, using MOBILE 6.2 emission factors and CAL3QHC software. CO concentrations were modeled at proposed signalized intersections or at intersections that would experience a configuration change in the project area.

The six intersections modeled for existing conditions, 2030 Baseline, and the four build alternatives are: Leary Way/Cleveland Street, Leary Way/159th Place NE, Bear Creek Parkway/Leary Way, Bear Creek Parkway/161st Avenue NE/159th Place NE, Redmond Way/159th Place NE, and Redmond Way/161st Avenue NE (see Figure 3.1). The Bear Creek Parkway/161st Avenue NE/159th Place NE intersection is not an existing intersection and is only proposed for the Alternative 4 alignment; so CO modeling was completed at this intersection for Alternative 4.

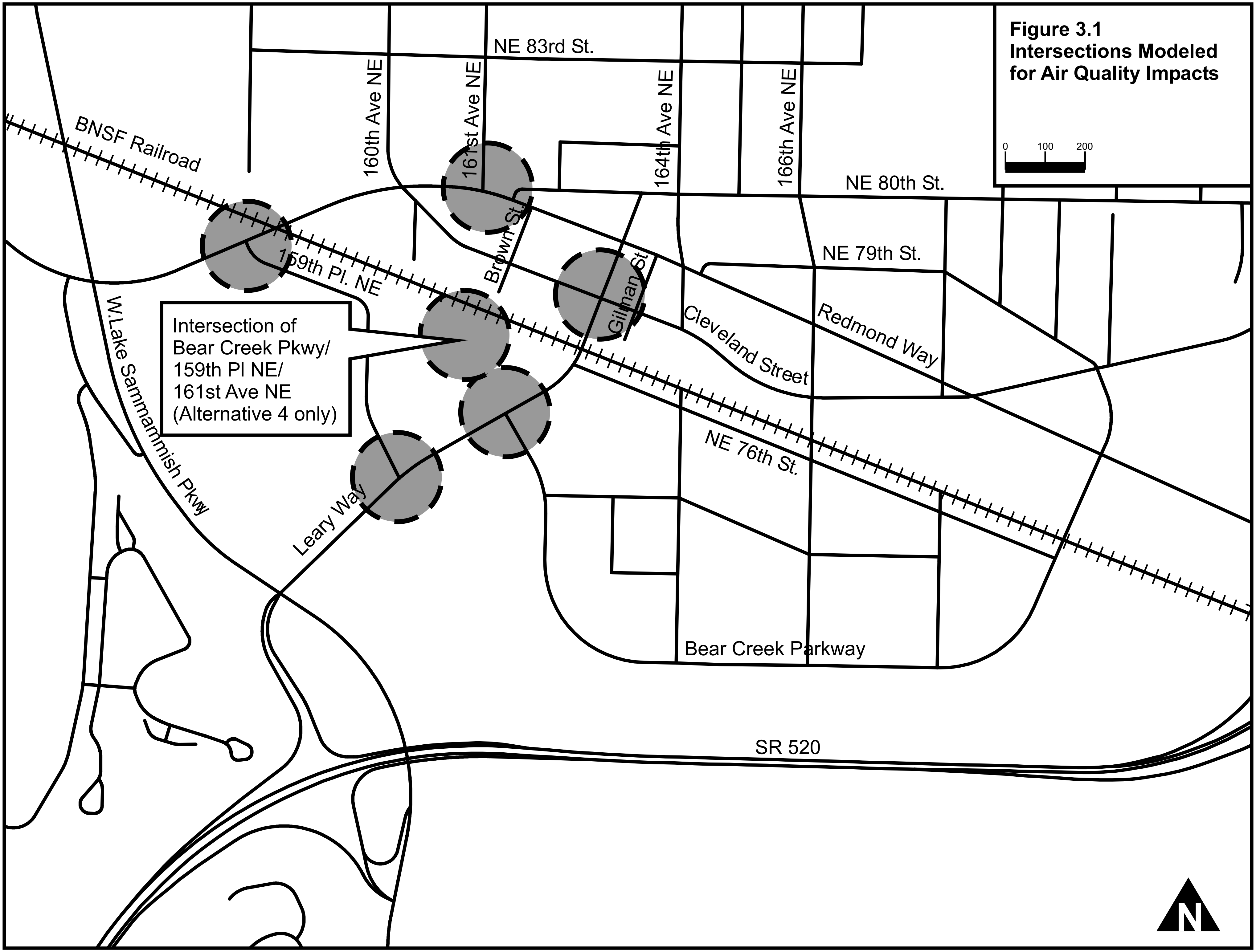

Figure 3.1
Intersections Modeled for Air Quality Impacts
0
100
200
NE 83rd St.
160th Ave NE
161st Ave NE
164th Ave NE
166th Ave NE
NE 80th St.
BNSF Railroad
NE 79th St.
159th Pl. NE
Brown St
Gilman St
Cleveland Street
Redmond Way
Intersection of
Bear Creek Pkwy/
159th Pl NE/
161st Ave NE
(Alternative 4 only)
W.Lake Sammamish Pkwy
NE 76th St.
Leary Way
Bear Creek Parkway
SR 520
N

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As discussed in the *Transportation* section, the 2030 No Action Alternative assumes implementation of the other projects in the Downtown Transportation Master Plan. The traffic data used for each model considered the effects of the upstream and/or downstream intersections that may have not been included in the model.

MOBILE 6.2 Model

MOBILE 6.2 is an updated version of the Mobile Source Emission Factor Model computer program developed by the EPA to calculate emission factors from highway motor vehicles in the units of grams of pollutant per mile traveled. Because MOBILE 6.2 accounts for gradual replacement of older vehicles with newer, less-polluting vehicles, the predicted emission rates for future years are lower than current emission rates.

Air quality pollutant emission factors for analysis of the 2002 existing conditions and 2030 No Action and build alternatives were estimated using EPA's MOBILE 6.2 emission factor program using data input provided by Ecology. The MOBILE 6.2 emission factors were developed in coordination with PSRC and Ecology, but do not represent the final MOBILE 6.2 factors that PSRC will adopt for regional conformity analysis.

CAL3QHC Model

CAL3QHC Version 2 is a line-source dispersion model that predicts pollutant concentrations near roadways. CAL3QHC input variables include MOBILE 6.2 free flow and calculated idle emission factors, roadway geometries, traffic volumes, site characteristics, background pollutant concentrations, signal timing, and meteorological conditions. CAL3QHC predicts inert pollutant concentrations in ppm averaged over a one-hour period near roadways. CAL3QHC was used to predict CO concentrations at affected study area intersections.

CAL3QHC predicts peak one-hour pollutant concentrations based on stable meteorology and peak-hour traffic flow. This study assumed a wind speed of 3 feet per second and evaluated wind directions in 10-degree increments to select the worst-case wind angle. Background CO concentrations were assumed to be 3 ppm averaged over one hour, to represent Puget Sound conditions (Ecology, 1995). An atmospheric stability class of D (urban land use) was modeled according to EPA Guidance (EPA, 1992). These conditions do not usually persist for an eight-hour period; so the worst-case eight-hour CO concentrations are lower than the maximum one-hour concentrations. The eight-hour average CO concentration is calculated by multiplying the maximum one-hour concentration by a persistence factor, which accounts for the time variance in traffic and meteorological conditions. EPA recommends a persistence factor of 0.7 for this area (EPA, 1992).

Existing Conditions

CO concentrations for 2002 existing conditions were modeled using the same methodology and locations as the 2030 predictions (see Tables 3.3 and 3.4). Because of consistent methodology and assumptions, modeled CO concentrations for 2002 can be compared with those predicted for future alternatives to show the air quality trend expected in the project area.

Table 3.3
Maximum One-Hour Average CO Concentrations (ppm) for the Project Area

Scenario	Intersection					
	Leary Way and Cleveland St.	**Leary Way and 159th Pl NE**	**Bear Creek Parkway and Leary Way**	**Bear Creek Parkway and 161st Ave NE and 159th Pl NE**	**Redmond Way and 159th Pl NE**	**Redmond Way and 161st Ave NE**
2002 Existing Conditions	9.1	8.9	8.8	NA	10.8	7.7
2030 No Action	5.5	6.1	7.8	NA	5.5	5.0
2030 Alternative 1	5.2	8.2	5.7	NA	5.6	4.7
2030 Alternative 2	5.9	7.8	9.3	NA	5.7	5.2
2030 Alternative 3	4.7	7.7	8.6	NA	5.5	5.5
2030 Alternative 4	4.7	7.8	8.2	5.0	5.1	5.1

Notes: Concentration values are in parts per million (ppm).
The one-hour average NAAQS for CO is 35 ppm.
N/A = Not applicable; intersection or roadway would not exist under the alternative.

Table 3.4
Maximum Eight-Hour Average CO Concentrations (ppm) for the Project Area

Scenario	Intersection					
	Leary Way and Cleveland St.	**Leary Way and 159th Pl NE**	**Bear Creek Parkway and Leary Way**	**Bear Creek Parkway and 161st Ave NE and 159th Pl NE**	**Redmond Way and 159th Pl NE**	**Redmond Way and 161st Ave NE**
2002 Existing Conditions	6.4	6.2	6.2	NA	7.6	5.4
2030 No Action	3.9	4.3	5.5	NA	3.9	3.5
2030 Alternative 1	3.6	5.7	4.0	NA	3.9	3.3
2030 Alternative 2	4.1	5.5	6.5	NA	4.0	3.6
2030 Alternative 3	3.3	5.4	6.0	NA	3.9	3.9
2030 Alternative 4	3.3	5.5	5.7	3.5	3.6	3.6

Notes: Concentration values are in parts per million (ppm).
The eight-hour average NAAQS for CO is 9 ppm.
N/A = Not applicable; intersection or roadway would not exist under the alternative.

Existing (2002) CO concentrations do not exceed the one-hour average NAAQS of 35 ppm (Table 3.3) at any location. The eight-hour average CO concentrations for 2002 do not exceed the NAAQS of 9 ppm (Table 3.4). Modeled maximum eight - hour CO concentrations for 2002 existing conditions are also within the NAAQS threshold of 9 ppm, ranging between 5.4 and 7.6 ppm.

Conformity Status

Within the State of Washington, transportation projects that are on the regional transportation system must comply with the EPA Conformity Rule's project-level conformity criteria and with Washington Administrative Code (WAC) Chapter 173-420. Regionally important projects must be included in a conforming Metropolitan Transportation Plan (MTP) and Transportation Improvement Plan (TIP) by the regional Metropolitan Planning Organization (MPO). The project area is in attainment for carbon monoxide (PSCAA, 2002), so no additional CO air modeling would be required. If changes occur in roadway alignment, anticipated future traffic volumes, or project area attainment status, future CO emission levels should be reevaluated. The Bear Creek Parkway Extension project has not yet been included in the conforming MTP and TIP to demonstrate conformity for ozone. Once the project is included in a conforming MTP and TIP, it will meet the conformity criteria of WAC Chapter 173-420.

Environmental Impacts

Long-term effects on air quality in the project area would primarily result from vehicle emissions. At some locations, air quality would improve in comparison to existing conditions due to future decreases in emissions per vehicle. This would offset increases in emissions from growth in background traffic and slower vehicular speeds.

Year 2030 No Action Alternative

Predicted worst-case CO concentrations under the 2030 No Action Alternative condition would be similar to existing conditions. No exceedances of the one-hour average NAAQS for CO were predicted under any of the analyzed intersections (Table 3.3). Predicted maximum eight-hour CO concentrations from vehicle emissions under the No Action Alternative ranged from 3.5 to 5.5 ppm for the year 2030 (Table 3.4).

Impacts Common to All Build Alternatives

Predicted worst-case CO concentrations for the build alternatives in 2030 would be similar to existing conditions and the 2030 Baseline condition concentrations at congested locations. No exceedances of the one-hour or eight-hour average NAAQS for CO were predicted under any of the build alternatives (Tables 3.3 and 3.4). Predicted maximum eight-hour CO concentrations from vehicle emissions for Alternative 1 would range from 3.3 to 5.7 ppm for the year 2030. Predicted maximum eight-hour CO concentrations from vehicle emissions for Alternative 2 would range from 3.6 to 6.5 ppm, 3.3 to 6.0 for Alternative 3, and 3.3 to 5.7 for Alternative 4 for the year 2030.

Construction activities would temporarily generate particulate matter and small amounts of carbon monoxide (CO) and nitrogen oxides (NO_x). If not properly mitigated, fugitive dust would escape from the construction site and from soil blown from uncovered trucks carrying materials. Vehicles leaving the site would deposit mud on public streets, which would become a source of dust after it dries. Construction equipment would emit CO and NO_x. These emissions would be greatest during the excavation phase, because most emissions would be associated with removing dirt from the site.

Dust emissions would be associated with demolition, land clearing, ground excavation, cut-and-fill operations, and roadway and interchange construction. Particulate emissions would vary from day to day, depending on the level of activity, specific operations, and weather conditions. Particulate emissions would depend on soil moisture, the soil's silt content, wind speed, and the amount and type of equipment operating. The quantity of particulate emissions would be proportional to the area of the construction operations and the level of activity. Based on field measurements of suspended dust emissions from construction projects, an approximate emission factor for construction operations would be 1.2 tons per acre of construction per month of activity (EPA AP-42, 1997). Emissions would be reduced if less of the site is disturbed or mitigation is performed.

A heron rookery and one condominium complex are located within 100 feet of the Alternative 2, 3, and 4 alignments. Two additional condominium complexes are located within 100 feet of the Alternative 1 alignment. Although more residences would be within 100 feet of the Alternative 1 alignment, Alternatives 2, 3, and 4 would have air quality impacts from construction at both residences and the heron rookery. Within 300 feet, dust from construction activities would be noticeable if uncontrolled. All build alternatives would require mitigation measures to comply with Chapter 70.94 RCW Clean Air Act, Chapter 173-400 WAC, and the Puget Sound Clean Air Agency (PSCAA) regulations that require dust control during construction and prevention of mud deposition on paved streets. Measures to reduce deposition of mud and emissions of particulate matter are identified in the following *Mitigation* section.

In addition to particulate emissions, heavy trucks and construction equipment powered by gasoline and diesel engines would generate CO and NO_x in exhaust emissions. These emissions would be temporary, limited to the immediate area surrounding the construction site, and would contribute a small amount compared to automobile traffic in the project area.

Some construction phases (particularly during paving operations using asphalt) would result in short-term odors. Odors might be detectable to some people near the project site, and would be diluted as distance from the site increases.

No on-site burning of slash or other debris would be allowed during construction. Because no asphalt batching or gravel crushing would occur on-site, no stationary source permits would be required.

Mitigation Measures

Particulate emissions (in the form of fugitive dust during construction activities) are regulated by PSCAA. According to PSCAA Rule 1, Section 9.15, fugitive dust from construction activities shall not be injurious to human health, plants and animals, or property, and shall not unreasonably interfere with the enjoyment of life and property. Additionally, a person may not operate a vehicle that deposits particulate matter on a paved, public highway (PSCAA Rule 1, Section 9.15). The Bear Creek Parkway project would comply with all PSCAA requirements regarding fugitive dust from construction projects.

Construction impacts would be mitigated by incorporating Best Management Practices (BMPs) into the project's construction specifications. The following source-control BMP mitigation measures would be implemented as required, to control PM_{10}, deposition of particulate matter, and emissions of CO and NO_x during construction. These measures would mitigate impacts to people and to the herons.

- Lower speed limits in the construction area. High vehicle speeds increase the amount of dust stirred up from unpaved roads.
- As soon as feasible, upgrade unpaved road surfaces by installing base course crushed rock and paving.
- Spray exposed soil with water to reduce emissions and deposition of particulate matter.
- To suppress dust emissions, use a dust palliative such as anionic Polyacrylamide (PAM) applied at the rate of one half-pound of PAM per 1,000 gallons per acre.
- Cover all trucks transporting materials, wet materials in trucks, or provide adequate freeboard (space from the top of the material to the top of the truck) to reduce dust and deposition of particulates during transportation.
- Provide wheel washers to remove particulate matter from wheels, wheel wells, fenders, tailgates, and running boards that would otherwise be carried off-site by vehicles. This would decrease deposition of particulate matter on area roadways.
- To reduce mud on area roadways, use high-efficiency vacuum trucks to remove particulate matter deposited on paved, public roads.
- Route and schedule construction trucks so that traffic delays are reduced during peak travel times. This will reduce secondary air quality impacts caused by reduced traffic speeds while waiting for construction trucks.
- Construct stabilized construction entrances where trucks enter public roads, to reduce mud track-out.
- Gravel or pave haul roads to reduce particulate emissions.
- Require appropriate emission-control devices on all gasoline or diesel fuel-powered construction equipment, to reduce CO and NOx emissions in vehicular exhaust. Use relatively new, well-maintained equipment to reduce CO and NOx emissions.
- Preserve natural vegetation and replant vegetative cover as soon as possible after grading, to reduce windblown particulates in the area.

Significant Unavoidable Adverse Impacts

The Bear Creek Parkway project is not predicted to cause any new violation or increase the frequency or severity of any existing violation of the NAAQS. Therefore, it would not result in any significant unavoidable adverse air quality impacts.

Water

The proposed project area for the Bear Creek Parkway is bounded by Bear Creek to the south and the Sammamish River to the west. Water from the proposed project will discharge to the Sammamish River. No drainage discharge into Bear Creek or any of its tributaries is anticipated. This document considers the following five factors relating to water resources:

- Surface Water Movement/Quantity/Quality
- Runoff/Absorption
- Floods
- Groundwater Movement/Quantity/Quality
- Public Water Supplies